Abstract of the Invention

The present invention provides a drug delivery system wherein a "parachute" structure is coupled to a therapeutic compound. The "parachute" structure comprises hydrophilic branched molecular fragments, or a cyclodextrin moiety, with a defined action diameter. The complex (a parachute structure coupled with a therapeutic compound) is either fixed at a cell membrane or delivered to a defined distance from the membrane within the cell. The membrane-anchoring/localizing effect of the parachute is achieved by hydrophilic structures linked with a branching unit of desired therapeutic compounds. Furthermore, the parachute structures can be connected by a spacer (e.g. β-amino acids, γ-amino butyric acid, or poly-amino acids) instead of directly binding to the therapeutic compound, so that the therapeutic compounds can be localized within the cells at a defined distance from the cell membrane. A spacer containing a breaking point can determine the time span, during which the drug exhibits its therapeutic activity. The hydrophilic residues can also carry signals for targeting the parachute-therapeutic complex to a defined tissue type. This can be mediated by an antibody which is specific for a tumor marker. Alternatively, a biotin can be attached at C6 position of the sugar and then react with an avidin-labeled tumor-specific antibody. The parachute function may also be achieved by other, more bulky hydrophilic structures such as oligosaccharides connected to the branching unit. Such sugar oligomers have specific attachment points to cell selectins, and therefore do not need additional molecular structures to target a specific tumor tissue. The use of the parachute structure gives the advantages of being able to localize a photosensitizer or chemotherapeutic drug at the site within a cell where it can destroy the tumor cell most effectively. This reduces the level of necessary systemic doses of the drugs, promotes drug excretion, and therefore considerably reduces side effects of the therapy.